

CLAIMS

1. A quantum cryptographic communication apparatus, characterized in that the apparatus comprises:

- a quantum communication path for transferring a quantum;

- a quantum transmitter apparatus provided on a transmission side of the quantum transfer path;

- a quantum receiver apparatus provided on a reception side of the quantum transfer path; and

- a control signal communication path connecting the quantum transmitter apparatus with the quantum receiver apparatus, the control signal communication path being used for communicating a control signal containing a synchronization signal between the quantum transmitter apparatus and the quantum receiver apparatus, and in that:

- the quantum receiver apparatus comprises:

- a light source serving as a quantum source;

- an optical path loop including a multiplexing/interfering means for generating time difference twin photon pulses composed of both a signal optical pulse and a reference optical pulse from a photon pulse outputted from the light source and for multiplexing and causing interference between the signal optical pulse corresponding to a retrograde quantum and the reference optical pulse;

- a bypass optical path including a phase modulator which is provided at a port connected to the quantum communication path, and phase-modulates only the reference optical pulse received after the time difference twin photon pulses are reciprocated via the quantum communication path between the quantum transmitter

apparatus and the quantum receiver apparatus; and

a photon detector for monitoring interference light passed through the optical path loop;

the quantum transmitter apparatus comprises:

a polarized wave rotating means for rotating polarization planes of the twin photon pulses at a right angle in a non-reciprocal manner, the twin photon pulses having reached thereto from the quantum receiver apparatus via the quantum communication path;

a phase modulator for phase-modulating a signal optical pulse passed through the polarized wave rotating means and returning the signal optical pulse to the quantum receiver apparatus through the quantum communication path so as to return the phase-modulated signal optical pulse to the quantum receiver apparatus; and

a beam attenuating means for attenuating the signal optical pulse such that the signal optical pulse includes less than two photons in the pulse.

2. The quantum cryptographic communication apparatus according to claim 1, characterized in that:

the bypass optical path is provided with a polarization beam splitter, the polarization beam splitter being provided at a branch point between a transmission optical path and a reception optical path of the bypass optical path; and

the polarization beam splitter allows, in a case where the polarization plane of the signal optical pulse of the twin photon pulses is equal to the polarization plane of the reference optical pulse thereof, only a fed-back photon pulse to pass through

the reception optical path in which the phase modulator is provided.

3. The quantum cryptographic communication apparatus according to claim 1, characterized in that a polarization modulator is provided between the optical path loop and the bypass optical path, the polarization modulator serving to align, in a case where the polarization plane of the signal optical pulse of the twin photon pulses is different from the polarization plane of the reference optical pulse thereof, the polarization planes of the twin photon pulses to match with each other in a going path by rotating the polarization plane of the signal optical pulse only when the signal optical pulse passes therethrough.

4. The quantum cryptographic communication apparatus according to claim 2 or 3, characterized in that the polarization beam splitter includes two sets of 1X2 input/output type polarization beam splitters for guiding only a photon pulse having a specific polarization plane to the reception optical path in which the phase modulator is provided.

5. The quantum cryptographic communication apparatus according to claim 2 or 3, characterized in that the polarization beam splitter includes one set of 2X2 input/output type polarization beam splitter for guiding only a photon pulse having a specific polarization plane to the reception optical path in which the phase modulator is provided.